characterization of dislocations. Nevertheless, the method has the problem of necessity of skill and time in measurement and a difficulty in application to samples of higher dislocation density.

In etch pit counting method, an etch pit is formed at the site where a dislocation reach the crystal surface, by a specific agent (etchant). Then, the number of etch pits is counted, whereby its density gives the dislocation density. Nevertheless, the etchant needs adjustment depending on the epitaxial crystal composition, thereby causing an extra time for searching the appropriate condition. Further, the method is not applicable to chemically stable crystals for which no effective etchant exists. The method has also a difficulty in application to samples of higher dislocation density and the problem of destructive test.

Cathode luminescence (CL) method uses the phenomenon that the intensity of luminescent light induced by electron beam irradiation is weak in the vicinity of dislocations. In the obtained luminescence intensity map, the number of dark spots or dark lines is counted, whereby its density gives the dislocation density. In the method, the sample is inserted into a scanning electron microscope unit, and this causes generally a necessity of breaking the sample, and hence, it is a destructive test. The method further has problems that only a narrow field can be observed and an application to a

sample having lower dislocation density is difficult.

As above, in the prior art methods, there have been problems that a wide range of dislocation density from low to high cannot be covered by a single method, and further, it is difficult to measure simply and non-destructively.

In the present invention, as the method of measurement of dislocation density in an epitaxial crystal, it becomes possible to cover a wide range of dislocation density from low to high by utilizing a photoluminescence method, and further it permits a nondestructive, rapid, and easy measurement.

That is, in the present invention, provided is a method of measurement of dislocation density in an epitaxial crystal comprising the steps of: irradiating an epitaxial crystal with laser light having a wavelength shorter than that corresponding to the band gap energy of the crystal composition; measuring the in-surface distribution of the peak intensity of thus-obtained photoluminescent light. The dislocation density (N cm^{-2}) is calculated from the number (n) of dark spots or dark lines and the area (S cm^2) of measurement region, according to the following formula (I).

$$N=n/S \qquad (I)$$

The method of measurement of dislocation density uses the phenomenon that in photoluminescence (hereafter, referred to as PL), PL intensity is very weak in the regions where dislocation exists. More specifically, when a dislocation line is

perpendicular to the surface, the region is recognized as a dark spot. In contrast, when a dislocation line is parallel to the surface, the region is recognized as a dark line. Further, when a dislocation line is at an angle α ($0^\circ < \alpha < 90^\circ$) relative to the surface, or when a dislocation parallel to the surface bends into perpendicular or inclined configuration relative to the surface, the region is recognized as a dark line segment.

For example, an epitaxial-layer dislocation having a dislocation line at an angle α ($0^\circ < \alpha \leqq 90^\circ$) relative to the surface generally originates from a dislocation in the substrate. A higher dislocation density in the substrate causes a higher dislocation density in the epitaxial layer and hence a higher dark spot density.

Further, a dislocation having a dislocation line parallel to the surface is generally what is called a misfit dislocation. This is caused by the lattice distortion resulted from the difference between the lattice constants of the stacked layer and the substrate. A larger difference in lattice constant causes a higher misfit dislocation density and hence a higher dark line density. In the invention, the number of these dark spots and dark lines is counted from the PL intensity map, whereby the dislocation density is obtained.

The method of measurement of dislocation density by means of PL mapping according to the invention is an optical and nondestructive detection method, and hence permits easy and